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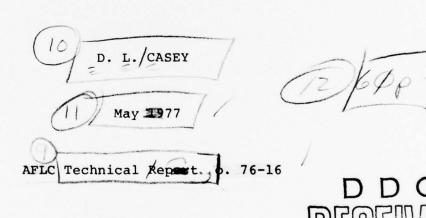
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LOGISTICS IMPACT OF LONGER C-5 MISSIONS

(19) AFLC-TR-76-16)





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ABSTRACT

This study was undertaken to determine the impact and savings to accrue from maximum commitment to longer C-5 missions (perhaps 15-17 hours) using inflight refueling. This was accomplished by reviewing maintenance writeup data for shorter flights versus longer flights. Traditional logistics forecasting techniques are based on the number of flying hours. Therefore, a change in sortic length would not be expected to impact on logistics requirements unless the overall number of flying hours changed. An examination of this relationship was undertaken in this study. It was found that the occurrence of a sortic tends to result in a given number of maintenance writeups regardless of the length of the sortic.

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PREFACE

This is one of several studies to evaluate the logistics impact of changing the length of sorties. This study, based on the C-5 aircraft, is an extension of a previous study on the logistics impact of changing the sortie length on F-4 aircraft (see Ref. 9). It attempts to identify those systems for which maintenance is impacted on by the number of sorties flown instead of/or in addition to the number of hours flown.

SUMMARY

This study has resulted in several observations and conclusions. Those observations and conclusions of this C-5A aircraft study which relate to length of sortie as opposed to type of sortie appear to be valid uniformly for all aircraft. This position is generally supported by the reports listed in the bibliography of this study. Most, if not all of the referenced reports, infer that the traditional approach of forecasting logistics support based on flying hours is subject to considerable error. While unanimous agreement as to the "ideal" forecasting model does not exist, most knowledgeable authors conclude that the number of sorties and the type of sorties flown has an impact on logistics support.

The following observations are made:

- a. Maintenance does not appear to be flying hour dependent. The number of maintenance write-ups per flying hour decreases monotonically as flight length increases.
- b. The occurrence of a sortie tends to result in a given number of maintenance write-ups regardless of the length of the sortie.

- c. Although the distribution of maintenance write-ups among the aircraft systems is not the same for all lengths of flight, no trend (either increasing or decreasing) is apparent as sortic length is increased.
- d. Although previous similar studies (see bibliography) on a variety of aircraft types conclude that the type of mission flown has an impact on the logistics support required, this study was not able to confirm that conclusion. Most C-5 flights are cargo hauling missions and hence multiple "mission codes" were not available for analysis. With the data used in this study, the sorties with "blank" mission code or mission code other than "cargo hauling" were concluded to exhibit the same maintenance write-up rate as the cargo hauling sorties. This is to be expected since the C-5 is a transport aircraft and a variety of maneuvers is not flown from sortie to sortie.
- e. This study was unable to relate maintenance writeups to actual demands on the wholesale logistics system.

 This is not a unique problem peculiar to this study or the
 C-5 aircraft. Maintenance write-ups are a standard data
 item and may result in three conditions: (1) labor being
 expended with no supplies expenditure (adjusting, calibra-

ting, cleaning, etc.), (2) labor and supplies expenditure against the base stocks (3) labor and supplies requests against the wholesale logistics system. No data system was found which would track the maintenance write-ups to actual demands on the wholesale logistics system. However, even though maintenance writeups were used instead of actual demands on the wholesale logistics system, it is felt that all findings of this study are valid and meaningful at least on an order of magnitude if not on a finite quantitative basis.

I. INTRODUCTION

This project was initiated by a letter from HQ USAF/LG, 8 March 1976, to HQ MAC/LG and HQ AFLC/LO. Within AFLC, the project was assigned to LOAC who, with the assistance of LOR, completed an initial review. In July 1976 it was determined that sufficient data was not readily available for a quick answer. Since HQ AFLC/XR had a similar study already underway to evaluate shorter sorties on the F-4 for TAC (See Ref. 9), XR became the OPR for this study.

This study was undertaken to determine the logistics impact and savings that would accrue from maximum commitment to longer C-5 missions (perhaps 15-17 hours) using in-flight refueling. Since traditional logistics forecasting techniques are based on the number of flying hours, a change of sortie length would not be expected to impact on logistics requirements unless the overall number of flying hours changed. An examination of this relationship was undertaken in this study.

II. DISCUSSION

A literature search was conducted through the Defense Documentation Center (DDC) and the Defense Logistics Studies Information Exchange (DLSIE). Although several studies hinted that a relationship exists between sortic length and maintenance rate, no substantive data was presented. In addition to the DDC and DLSIE literature searches, contact was made with Douglas Aircraft Company and with Boeing Company. Information received from those sources was quite valuable.

a. Boeing report #D162-10015-1, "B-52D Operations Southeast Asia vs CONUS," concluded that after four hours
of a twelve hour mission, 50% of the failure and 47% of
the abort causing conditions have occurred. At eight hours
the percentages are 80% and 93%, respectively. The data
used in this current C-5 study did not permit identifying
maintenance write-ups with the portion of the flight at
which the condition occurred. However, as will be discussed
later in this report, this study concludes that longer
flights do not result in any more maintenance write-ups than
short flights.

b. Douglas Aircraft Company #MDA 75-055, "Initial Maintenance Cost Prediction Method," contains a table which shows the change in maintenance cost as the length of flights changes. The Douglas report did not contain supportive information and efforts to obtain additional information from Douglas Aircraft Company were unproductive. The contact point at Douglas Aircraft Company stated that the company had invested over three years on an in-house study and was reluctant to disseminate the information to outside organizations.

Although the Boeing and Douglas reports do not apply specifically to the C-5 aircraft, they are felt to be valuable background information. Review of the bibliography will show that many reports have been written over the past 10 or more years relative to forecasting and/or evaluating the maintenance aspects of various aircraft. Those reports resulted in recommendations for several data collection improvements to permit relating maintenance data to specific sorties and missions. They observed that a major obstacle to routinely analyzing aircraft malfunction and maintenance data was the absence of a method for relating sortie information to maintenance records.

In reviewing possible data bases for use in this study, it was determined that the Maintenance Analysis Detection and Reporting System (MADARS) would be the best data source for the C-5 aircraft. Data was requested from the MADARS system at OC-ALC. This system provided flying hour and maintenance data for each aircraft on an individual sortie basis. The data was grouped by sortie length and the maintenance rates were calculated for each major system of the aircraft. Maintenance rates were then compared to determine whether sortie length affected maintenance rate. That is, is the maintenance rate for five two hour flights and the maintenance rate for one ten hour flight equal or is there an effect caused by the fact that the five two hour flights result in four additional takeoffs and landings (high stress conditions) as well as four additional cocles "on" and "off" of all electrical and electronic equipment?

Review of flying hour data revealed that on a given day, an aircraft might fly 0-20 hours and make up to 43 landings and still be classified as flying "one sortie." The distributions of landings/sortie and flying hours/sortie are shown in Tables 1 and 2. Those distributions represent 9001 sorties flown July 1975 - September 1976 inclusive.

Landings/Sortie	July 1975 - Se	eptember 1976
Landings	<u>*</u>	Cum %
1	58.5	58.5
2	12.5	71.0
3	2.5	73.5
4	1.4	74.9
5	1.2	76.1
6	1.2	77.3
7	1.3	78.6
8	1.5	80.1
9	1.8	81.9
10	2.4	84.3
11-15	11.1	95.4
16-20	2.1	97.5
21-25	1.5	99.0
26-30	0.7	99.7
31+	0.3	100.0

Flying Hours/Sortie	July 1975 - 8	September 1976
Flight Length (Hrs)	<u>*</u>	Cum %
0-2	8.9	8.9
2-4	18.3	27.2
6-8	31.6	58.8
8-10	19.4	78.2
10-12	3.6	97.8
12-14	1.3	99.1
14-16	0.6	99.7
16+	0.3	100.0

Since sorties consisting of a single landing comprise a significant portion of all C-5 sorties, namely 58.5% a decision was made to restrict the data used in this study to those sorties having a single landing. That decision permitted the evaluation of sorties (cycles) as a predictive variable while eliminating "noise" that could result from attempting to differentiate among "landings" versus "full stop landings" versus "landing gear cycles" versus "engine cycles," etc.

III. PROCEDURE

This study examined data for the entire C-5 fleet since only 77 aircraft are involved. A special program was developed by Oklahoma City ALC personnel to extract flying hour data and maintenance data from the MADARS system for the period August 1976 - December 1976. As stated previously, "sorties" which consisted of multiple landings were excluded from consideration for this study. Also excluded from consideration in this study was any impact on the tankers that might be used for refueling the C-5 aircraft to accomplish longer length sorties.

The data extracted from the MADARS system consisted of all single landing sorties flown by each C-5 aircraft during the period August 1976 - December 1976. It contained the flight length and maintenance writeups that resulted from each flight, by aircraft serial number.

The data was arrayed in two hour flight length segments for 0-14 hour flights. Flight lengths exceeding 14 hours were excluded since too little data was available for valid analysis. A summary of the data is shown in appendix 1. An explanation of the work unit codes (WUC) is contained in Appendix 2.

As stated above, the maintenance data used in this study were the maintenance writeups that resulted from each single landing sortie. Maintenance writeups do not necessarily result in demands (requisitions) on the wholesale supply system. Ideally, the maintenance data desired is the number of demands on the supply system which result from sorties of various length. Unfortunately, this link was not possible. Certainly data exists regarding the number of demands made against any specific federal stock numbered item. However, it is not possible, with the data used in this study, to track that demand back to a specific sortie. Such a link probably cannot be made without developing a new data system specifically for that purpose. Efforts are being made to determine that relationship. It is felt; however, that regardless of the exact correlation between "maintenance writeups" and "demands", the conclusions drawn from this study relative to the effect of sorties, flying hours, mission type, critical systems, etc. are valid and meaningful. At worst, the conclusions would show only an order of magnitude as opposed to a finite quantitative value.

IV. HYPOTHESES

Three hypotheses were tested:

H₁ - Maintenance rate is dependent on the length of the flight. That is, maintenance rate is a function of flying hours and is not affected by engine startup, take-offs, landings, equipment cycles on and off, etc.

H₂ - if H₁ is false in the sense that a greater maintenance rate occurs on short flights, then the distribution of maintenance writeups which occur on short flights is the same as the distribution for writeups which occur on longer flights. That is, each work unit code (WUC) accounts for the same percentage of writeups regardless of the length of the flight.

H₃ - The type of mission flown (mission code) has an effect on the number of maintenance writeups. That is, some types of missions are more demanding on the various aircraft systems than other mission types are.

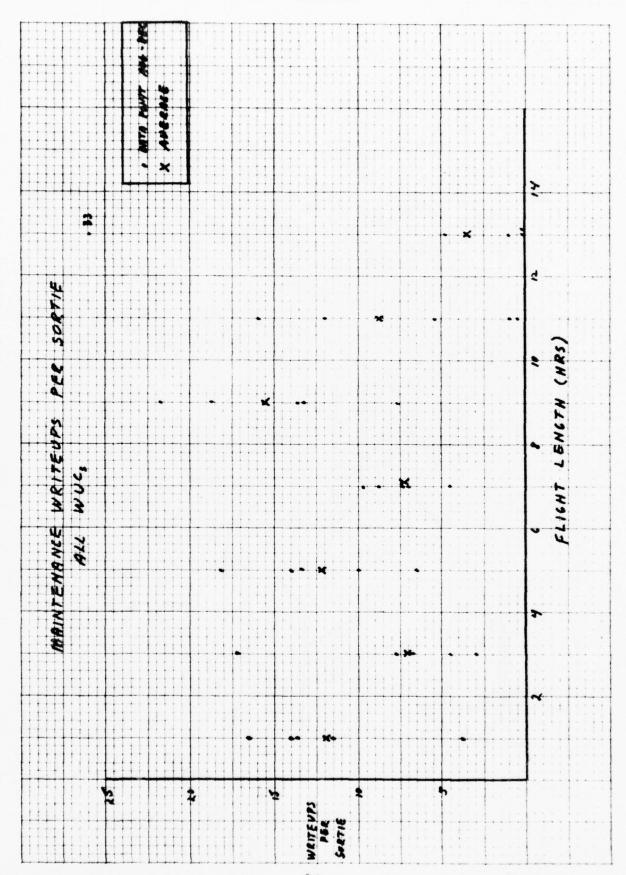
Hypothesis #1 (maintenance rate is flying hour dependent) was evaluated by analyzing the number of maintenance writeups per flying hour and the number of maintenance writeups per sortie for each flight length (in two hour groupings). If maintenance rate is flying hour related, the number of maintenance writeups per flying hour would be the same regardless of the sortie length. As shown by the last six columns of Appendix 1, the number of maintenance writeups per flying hour decreases monotonically with increased sortie length. Those same six columns of Appendix 1 also show that the number of maintenance writeups per sortie is not monotonically increasing or decreasing, but remains basically constant regardless of the length of the sortie. That data is presented in summary form for all work unit codes (WUC) and with WUC 01-09 excluded. WUC 01-09 are "ground support" actions while the remaining WUCs are "aircraft systems" related (see Appendix 2). The data was analyzed in those two groupings since certain maintenance writeups (WUC 01-09, refueling, aircraft cleaning, inspection, etc.) are related to the fact that a sortie occurred and are independent of the type or length of mission flown. Review of the two groups of data will show that the conclusions relative to the maintenance writeup rate per flying hour and per sortie are the same regardless of which WUC grouping is used. Only the quantitative value of the maintenance writeup rate changes, the overall pattern does not. This relationship is further shown in figures 1 through 4.

De les la rationales and references

. DATA POINT AUG-DEC X AVERAGE MAINTENANCE WRITEUPS PER FLYING HOUR FLIGHT LENGTH (HRS) EXCLUDING WUC OF-09 WETTEVPS

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Figures 1 and 3 present data for all WUC; figures 2 and 4 present data with WUC 01-09 excluded. Data is plotted for each month August-December 1976 and for each two hour flight length grouping from 0-14 hours. Figures 1 and 2 show a definite curve with relatively little scatter of data.

Figures 3 and 4, however, display considerable scatter in the data with no discernable pattern. Even with the severe scatter, it is obvious that neither a monotonically increasing nor a monotonically decreasing relationship exists. Using the average value for each flight length group, the best curve fit is a straightline of constant value.

Hypothesis \$2 (each WUC accounts for the same percentage of writeups regardless of the length of the flight) was evaluated by tabulating the percentage of sorties within each flight length grouping and comparing those percentages with the percent of maintenance writeups which fell within each grouping. That tabulation is shown in table 3. This is another way of showing what was presented in the previous section, namely that the rate of maintenance writeups per sortie is relatively uniform over all sortie lengths.

Table 4 lists the "ground support" (WUC 01-09) maintenance writeups and the fifteen aircraft systems with the most writeups. A tabulation was made of what percent of writeups

SORTIES AND MAINTENANCE WRITE-UPS AUG 76-DEC 76

FLIGHT	SORTIES		MAINT WE	RITE-UPS	MAINT WRI	MAINT WRITE-UPS			
LENGTH			(All Wor	k Unit	(Excludin	g WUC-01-			
			Codes "V	NUC")	09)				
(Hrs)	No.	8	No.	<u>*</u>	No.	8			
0-2	230	11.8	2691	12.7	1947	11.9			
2-4	370	19.0	2585	12.2	1859	11.4			
4-6	457	23.4	5613	26.4	4704	28.8			
6-8	348	17.8	2603	12.3	2063	12.7			
8-10	447	22.9	6975	32.9	5122	31.4			
10-12	77	3.9	680	3.2	537	3.3			
12-14	22	1.1	79	0.4	75	0.5			

MAINTENANCE WRITE-UPS AUG 76-DEC 76

FLIGHT LENGTH (HOURS)

WUC	0-2	2-4	4-6	6-8	8-10	10-12	Total
	*	8	*	8	8	*	8
01-09	27.5	28.2	16.2	20.8	26.6	21.1	23.3
11	13.2	13.9	14.8	13.8	15.7	17.5	14.7
23	8.4	8.3	8.2	7.3	7.3	7.6	7.8
13	7.8	6.4	7.9	10.8	6.0	3.8	7.3
72	4.6	5.8	7.5	5.6	6.3	7.9	6.3
55	6.0	5.1	7.9	5.0	5.2	7.1	6.0
41	3.3	4.1	4.1	3.1	4.1	5.1	3.9
51	2.7	3.2	4.2	2.7	3.7	3.2	3.5
12	2.8	3.2	3.6	2.7	3.2	3.1	3.2
44	2.9	2.4	3.4	3.9	3.0	4.0	3.2

45	3.6	2.6	3.2	4.2	2.7	3.4	3.1
52	2.7	3.2	3.9	2.0	3.1	2.8	3.1
46	2.0	1.6	2.5	2.1	2.4	2.8	2.3
42	2.1	1.9	2.3	2.7	1.6	1.5	2.0
14	2.8	1.5	1.9	1.7	1.0	1.2	1.6
24	1.0	1.3	1.5	1.9	0.9	1.2	1.3
Misc	6.6	7.3	6.8	9.7	7.2	6.7	7.4
Total	100	100	100	100	100	100	100

each WUC accounted for within each flight length as well as overall for the composite of all flights. Review of table 4 indicates that no trend is apparent, either increasing or decreasing, as flight length changes. The question is: the distribution of writeups, by WUC, vary significantly for different length flights? A test of independence was carried out using a contingency table. Table 5 classifies maintenance writeups (actual and expected) by WUC and flight length. To obtain the theoretical frequencies (based on the assumption of independence), we apply the marginal percentages for the composite of all flight lengths to the totals for each flight length. Thus the expected frequency for WUC 11 for flight length 0-2 hours is $\frac{3|2|}{2|126}$ X 2691 = 396, etc. To test the hypothesis of independence for table 5, we compute $(F_{ij} - f_{ij})^2$ where Fij is the actual frequency of row i, column j and fij is the frequency of row i, column j that would be expected based on the hypothesis of independence. That calculation is carried out in table 6. The value of the summation is 481.70. We compare this result with the χ^2 0.05 point for the proper value of n. This sets the risk of rejecting the hypothesis when it is true at 0.05. In this test, n = (number of rows - 1) (number of columns - 1); or (12-1) (6-1) = 55. Most χ^2 tables do not contain values for n 30. For larger values of n the formula: # = $\sqrt{2x^2} - \sqrt{2n-1}$ is used where # is the value of a variable measured from its mean and expressed in standard deviation

FLIGHT LENGTH (HRS)

															-			
sms			PS															
	TOTAL	MAINT	WRITE-UPS		4919	3121	1659	1552	1337	1276	835	745	683	929	199	3756	21226	
	4	E	UPS	EXP	176	112	59	55	48	46	30	27	24	24	23	134		
	10-14	MAINT	WRITE-UPS	ACTUAL	147	120	62	32	09	51	43	25	29	29	25	136	759	
	0.	£	.UPS	EXP	1616	1025	545	510	439	419	274	245	224	222	219	1234		
	8-10	MAINT	WRITE-UPS	ACTUAL	1853	1097	207	420	437	360	284	258	220	207	188	1144	6975	
		£	·UPS	EXP	603	383	203	190	164	156	102	91	84	83	82	461		
	8-9	MAINT	WRITE-UPS	ACTUAL	540	359	191	280	147	130	81	17	17	102	109	522	2103	
		E	UPS	EXP	1301	825	439	410	354	337	221	197	181	179	176	993		
	4-6	MAINT	WRITE-UPS	ACTUAL	606	831	459	444	420	441	230	236	203	196	182	1062	5613	
		E	UPS	EXP	599	380	202	189	163	155	102	16	83	82	81	457		
	2-4	MAINT	WRITE-UPS	ACTUAL	726	360	214	165	150	132	107	83	8	63	99	435	2585	
		E	.ups	EXP	624	396	210	197	170	162	106	94	87	98	82	476		
	0-2	MAINT	WRITE-UPS	ACTUAL	744	354	226	211	123	162	06	72	91	79	97	457	2691	
		WUC			01-09	11	23	13	72	55	41	51	12	44	45	OTHER	TOTAL	
		3			0			21				TABI	Æ 5			0	F	

The sum of the "expected value" rows and columns may differ slightly from the sum of the "actual value" rows and columns due to rounding. NOTE:

$$\leq \frac{(\mathbf{F_{ij}} - \mathbf{fi_j})^2}{\mathbf{fij}}$$

WUC	0-2	2-4	4-6	6-8	8-10	10-14	TOTAL
01-09	23.08	26.93	118.11	6.58	34.76	4.78	214.24
11	4.45	1.05	.04	1.50	4.91	.57	12.52
23	1.22	.71	.91	.71	2.65	.15	6.35
13	.99	3.05	2.82	42.63	15.88	9.62	74.99
72	12.99	1.04	12.31	1.76	.01	3.00	31.11
55	0	3.41	32.09	4.33	8.31	2.63	50.77
41	2.42	.25	.37	4.32	.36	5.63	13.35
51	5.15	.70	7.72	4.40	.69	.15	18.81
12	1.39	.01	2.67	2.01	.07	1.04	7.19
44	.57	4.40	1.61	4.35	1.01	1.04	12.98
45	1.69	2.78	.20	8.89	4.39	.17	18.12
OTHER	.76	1.06	4.79	8.07	6.56	.03	21.27
TOTAL	54.71	45.39	183.64	89.55	79.60	28.81	481.70

units. The # value corresponding to a 0.05 risk is 1.65. Substituting this value in the formula gives a χ^2 value of approximately 73. Since 481.70 is greater than 73 we conclude that there is a difference in the distribution of maintenance writeups among flight length groupings. Indeed, the difference is so great that we would have rejected the hypothesis of independence at the 0.001 level of significance, since the 0.001 point of the χ^2 distribution for χ^2 distribution for χ^2 distribution for the figure 4.55 is approximately 90. However, as stated above, no trend (either increasing or decreasing) is apparent as flight length changes.

Hypothesis #3 (some types of missions are more demanding on aircraft systems than other missions) was not included in the initial definition of this study. It was added only after a similar study on the F-4 aircraft concluded that mission code was a significant determinant of maintenance writeups.

(See Ref. 9) Therefore, the August-October 1976 data extracted for this study did not contain a mission code designation. The addition of mission code was included in the data extracted in November 1976 and December 1976. Those two months of data were analyzed for mission code impact with the following results:

- a. Of 401 sorties in November 1976; 270 sorties had a blank mission code, 92 sorties had an "MI" mission code (scheduled transport missions in which the primary objective is the movement of cargo. Ref: AFR 60-1, atch 2, 2 Jan 75), and 39 sorties contained mission codes other than "MI".
- b. Of the 363 sorties in December 1976; 199 sorties had a blank mission code, 140 sorties had an "MI" mission code, and 24 sorties contained mission codes other than "MI".
- were each tested using the Aspin-Welch t test (See Ref. 10) to determine whether there was a significant difference in the maintenance writeups per sortie between "blank" mission code sorties, "MI" mission code sorties and the universe of all mission codes. The Aspin-Welch procedure is used to test the difference between two simple means when and are unknown and may not be equal. In all cases tested, for both November and December, it was concluded that the samples came from the same universe; that is, "blank" mission code and "MI" mission code have the same maintenance writeup rate per sortie as the universe of all mission codes. Appendices 3 and 4 show the data and the statistical test for November and December respectively.

V. REGRESSION ANALYSIS

A regression analysis was made using data from August 1976 - December 1976. Seven data points were used for each of the five months. The data points for each month correspond to the flight length groupings used throughout the study. The results of the regression analysis are shown in Appendix 5. An analysis was conducted for the total maintenance write-ups observed, all WUC except 01-09, and the 10 aircraft systems having the largest number of maintenance writeups. Review of Appendix 5 brings out the following:

- a. The coefficiency of determination was always in the 50-70% range. Hence, it is estimated that flying hours and sorties jointly account for 50-70% of the variance in the number of maintenance write-ups. This is neither an extremely strong nor extremely weak relationship for forecasting maintenance write-ups.
- b. The standard error of the estimate () is relatively high in all cases tabulated. This means that the forecast values will vary considerably from the actual values
 of maintenance write-ups. This substantiates the statement
 in paragraph a above that the regression fit is not an
 exceptionally good one.

c. In addition to the regression runs of flying hours and sorties jointly as a predictor of maintenance writeups, two additional sets of runs were made. Flying hours alone were evaluated as a predictor of maintenance writeups and sorties alone were evaluated as a predictor of maintenance writeups. Comparison of the joint runs and the two individual runs shows that in all twelve cases the R2 for the joint run is higher than either of the R²s for the individual runs. Additionally, review of appendix 5 shows that for 10 of the 12 groups of WUCs evaluated, the R² for sortie was larger than the R^2 for flying hours, although the difference between the two was relatively small in some cases. This indicates that sorties are a slightly better predictor of maintenance writeups than flying hours are. Adding the second variable in the regression run of the joint effect of flying hours and sortie increases the R² value about 10%.

VI. CONCLUSIONS

- 1. The number of maintenance writeups per flying hour decreases monotonically as flight length increases.
- 2. The number of maintenance writeups per sortie remains constant regardless of flight length.
- 3. The distribution of maintenance writeups which occur on short flights is not the same as for writeups which occur on longer flights. That is, each work unit code does not account for the same percentage of writeups regardless of the length of the flight. However, no trend increasing or decreasing was observed as flight length increased.
- 4. The type of mission flown (mission code) is not a significant factor in determining the number of maintenance writeups on the C-5. This results from the fact that most C-5 flights are cargo hauling missions.

VII. OBSERVATIONS

- 1. A study should be undertaken to relate maintenance writeups to actual demands on the wholesale logistic system. No
 current data system was found that could track this relationship. Hence, a new data collection system would have to be
 designed specifically for this purpose.
- 2. Forecasts of future requirements should consider "sorties" as well as "flying hours".
- 3. Further study should be made regarding the impact of mission code on logistics requirements for other aircraft types.

 Because of the singular type mission (cargo hauling) flown by the C-5A, a true evaluation of mission type could not be accomplished in this study. However, the F-4 study (See Ref. 9) of the logistics impact of changing the sortic length indicated that a strong relationship exists between mission type and maintenance support requirements.

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APPENDIX 1

SUMMARY OF DATA

BEST AVAILABLE COPY

C-5 PUNITE HOURS & MAINTHAUCT ACTIONS FOR ALL AIRCRAFT AUGUST 1976 - HOVEMBER 1976

FLIGHT LFMCTH	nons Tains	SOTOIPS	TUC 21 GRND HAND	TUC 02 CLFANING	WUC 03 SCH INSP	NUC 04 SPEC INSP	WUC 05 PRESERV
0-2							
AUC	55	15	25		•		
SEL	16	37	87		3	6	
OCT	3.4	69		4	35	73	
vov	33		111	7	29	13	
		35	77	3	14	7	
DEC	53	2.4	139	14	41	18	
TOTAL	276	230	439	28	122	117	0
2-4							
AUG	314	100	54	1	1	5	
Spp	165	52	122	4	88	111	
OCT	124	73	50	2	18	23	4
YOV	224	60	53	6	25		
DEC	232	7.0	51	4		16	
TOTAL,	1059	370	358	17	25	6	
O MI	10.10	370	3.311	17	157	161	4
1-6							
AUC	564	113	75	9	1	9	
SPD	476	95	160	17	5		
OCT	502	116	179			22	2
AOA	393	76		2	64	20	
DEC	205	57	67	2	24	9	
TOTAL	2300		121	8	30	7	
10111	2339	157	602	39	124	67	2
6-9							
M'G	405	56	3.4	1	13	19	3
SPP	23.3	30	66	5	2	. 19	4
OCT	641	91	76	12	ī	13	
707	671	93	30	10	14	16	2
DEC	494	69	31	13	1		
TOTAL.	2493	348	346	41	31	10 77	9
2 12							
3-10	1000						
AUG	761	86	7.2	4	4.2	27	1
SEP	593	6.5	150	5	63	19	
OCT	770	35	145	4	42	13	2
MOV	982	103	464	29	170	35	
DEC	227	103	351	12	70	40	1
TOTAL	1023	447	1103	61	387	134	4
12-12							
AUG	65	6					
SEP							
	106	10	2			2	
OCT	230	21	9		1	3	
,10A	219	20	43		17	3	
DEC	215	20	41		15	7	
TOTAL.	135	77	95		33	15	
12-14							
AUG	5.2						
SED	13	1	1				
OCT	13	1					
2011	103	8					
DEC	104	q	1				
TOTAL			2				
1017th	285	22	4				
מעשטה הטשער	11271	1951	3027	185	854	571	19

C-5 FLYING HOURS & MAINTENANCE ACTIONS FOR ALL AIRCRAFT AUGUST 1976 - NOVEMBER 1976

FLIGHT LENGTH	FLYING HOURS	SORTIFS	WUC 07 RECORDS	SHOP SUPP	VI SESVE VIIC	COCKPIT COCKPIT	MUC 13 LTD GFAR
0-2							
NUG	55	45	4	2	3.4	0	12
GED	46	37	15		39	9	23
OCT	84	69	17		108	3.0	65
YOU	3.9	35			6.3	7	51
DEC	53	44			61	21	57
TATAL	276	230	36	2	354	7 -	211
2-4							
MIG	314	106	2		42	10	13
STP	165	52	19		129	21	3 1
OCm	124	73	4		70	23	67
עמע	224	60		2	65	20	2 -
DEC	232	7.0		2	46	10	21
mOmVT'	1059	370	25		360	34	165
1-6							
מנות	564	113	15	~-	110	3 1	4.5
SEP	476	95	16	2	301	4.	139
OCT	582	116	9		223	62	127
AOA	383	76	2	1	100	36	5.5
DEC	295	57		1	39	33	66
TOTAL	2300	457	72	4	831	203	441
6-8							
AUG	405	56	3	~-	4.9	3	9
SEP	282	39	18		70	3	15
OCT	641	91	8	~-	107	1.4	74
YOV	671	93		2	70	30	59
arc	494	69			54	16	123
COTAL	2493	348	34	2	359	71	280
01765	2423	340	3.1		333		2007
3-10							
AUG	761	86	15	1	106	16	3 0
SEP	593	65	26		173	23	3.1
och	770	85	36		130	40	87
JUN.	982	108	1	3	353	60	157
DEC.	927	103	1	1	275	31	119
TOTAL	4023	447	79	5	1997	220	420
10-12							
AUC	65	6	~-		6		
GEP	106	10					
OCT	230	21	~-		25	4	8
NOA	219	20	~-		3.6	3	16
DEC	215	20			5.2	0	2
TATE	835	77			119	21	26
12-14							
AUG	52	4					
SFP	13	1			1		2
OCT	13	1					
AOA	103	3				1	
DEC	104	8				7	4
momal,	285	2.2			1	3	6
RAND TOTAL	11271	1951	246	17	3121	633	1552

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C-5 PLYING HOURS & MAINTENANCE ACTIONS FOR ALL AIRCRAFT AUGUST 1976 - NOVEMBER 1976

er rene	FLYING	SORTES	14	23	WUC 24	WUC 41	WUC 4.2
L'ESE SANT	HOURS		CONTROLS	ENGINE	AUX ENG	AIR COND	POWER SUI
0-2							
Attici	55	4.5	- 3	11		3	9
2120	4.6	17	7	50	8	23	8
Nam	24	69	21	67	7	37	12
.i(M.	3.0	35	11	54	4	16	14
1931/1	53	2.1	29	4.2	7	11	13
aGaYF	276	230	76	226	26	90	56
2-4							
711/3	31.4	196	2	39	4	18	3
cep	165	5.3	16	65	7	43	1.9
OCT	1.24	73	6	47	7	20	12
.1(3/)	224	69	3	4.4	8	13	11
DEC	212	7.0	13	19	7	13	5
in section	1050	370	40	214	33	107	4.0
1-6							
X110	551	113	7	45	9	3.2	13
errp	176	95	31	137	26	72	56
DC.u.	532	115	27	171	24	72	36
11011	373	76	2.6	55	14	32	12
W.C.	225	5.7	17	51	q	22	14
"O"A1,	2300	457	100	459	82	230	131
$\bar{e} = \mathfrak{A}$							
AUG	425	5.6	7	2.2	3	11	8
CEN	292	19	1	19	5	12	9
oce	641	9.1	15	62	13	22	13
NOV	671	9.3	1.4	46	13	19	2.4
DUC	494	6.9	1.1	46	10	17	15
TOTAL.	2423	348	4.1	191	49	81	69
2-10							
MUG	761	2.6	,	59	3	23	10
(11.13	593	65	5	68	5	45	10
OCC	770	95	11	96	17	52	21
YOV	932	103	29	146	31	69	50
D1.6	927	103	25	138	10	95	21
mar.71.	1023	117	72	507	66	284	112
10-12							
2110	65	6					
chb	106	10					
oce	230	21		8	2	4	4
nov	219	2.2	,	35	3	17	5
DEC	215	2.0	6	9	3	14	1
TOTAL	335	77	3	52	8	35	10
12-14							
AUG	5.	1		***	~-		
SEL	1.3	1	1	5	1	7	4
ocm	13	i					
107	123	77	10.10	1			
21.0	104			À	2	1	2
momAL	235	22	1	10	3	3	÷ ÷

C-5 FLYING HOURS & MAINTENANCE ACTIONS FOR ALL AIRCRAFT AUGUST 1976 - MOVIETRE 1976

FLIGHT LENGTH	FLYING HOURS	SORTIES	WUC 44 LIGHT	UUC 45 HYDRAULIC	WUC 46 FUEL	UUC 47 OXYGEN	WUC 49 MISC UTIL	MUC 51 THST
0-2								
AUG	55	45	4	6	2	2	3	
SEP	46	37	10	17	2 7	ī	5	27
OCT	84	69	41	21	21	10	15	13
AOA	38	35	12	27	16	1	6	10
DEC	53	44	12	2.6	0	4		17
TOTAL.	276	230	79	97	5.4	13	29	7.2
?-4								
AUG	314	106	5	16	,	3	5	14
SEP	165	52	16	16	6	2	6	2.3
OCT	124	73	19	q	1.5	2	9	17
YOU	224	69	14	16	7	1	5	24
DEC	232	70	9	10	ġ	1	1	5
TOTAL	1059	370	63	66	4.3	9	25	33
4-6								
AUG	564	113	36	16	14	4	3	29
SEP	476	95	44	40	3.4	9	1.3	33
OCT	582	116	61	73	47	12	15	60
NOV	383	76	23	23	17	3	5	30
DEC	295	57	32	25	18	2	1.1	34
TOTAL	2300	457	196	182	140	35	61	236
6-8								
AUG	405	56	9	7	3	2	4	10
SEP	282	39	19	12	5	5	i	7
OCT	641	91	36	13	12	3	13	15
YOU	671	93	24	33	19	6	10	18
DEC	494	69	14	3.4	15	-1	5	21
TOTAL	2493	348	102	109	54	2.5	33	71
9-10								
AUG	761	86	17	1.0	1.4	4	5	24
SEP	583	65	18	24	13	2	6	3.2
OCT	770	85	40	38	3.	2	17	29
VOV	982	108	71	59	53	10	25	91
DEC	927	103	61	57	51	11	6	8.2
TOTAL	4023	447	207	198	170	29	50	258
10-12								
AUG	65	6						
SEP	106	10						
OCT	230	21	1	4	3	1	3	2
NOV	219	20	15	1.3	10		2	1.3
DEC	215	2.0	11	6	6	2	1	7
TOTAL	835	77	27	23	19	3	6	22
12-14		· Vel						
AUC	52	4						
SEP	13	1			2		1	- 2
OCT	13	1	~-					
NOV	103	3	1	2		1		
DEC	104	8	1		1	1		1
TOTAL	285	22	2	2	3	2	1	3
GRAND TOTAL	11271	1951	676	967	102	116	214	745

C-5 PLYING HOURS & MAINSPHANCE ACTIONS FOR ALL AIRCRAFT AUGUST 1976 - NOVEMBER 1976

PLICUS LPMGTH	FLYING	SOUMTES	AUTO PILOT	NUC 55 MADAR	WUC 61 HF COM	WUC 62 VHF COM	WUC 63 UHF COM
			710.43			VIII COM	OHF COS
2-3							
VIIC	55	4.5	5	18	1	~-	1
SEP	4.6	3.7	15	43	3		3
OCT.	34	69	2.7	44	5	~-	6
NOA	38	3.5	1.0	27	3	3	3
DEC	53	4.4	1.5	30	8	1	2
TOTAL,	276	230	7.2	162	20	4	15
2-4							
AUG	314	105	13	22	2	1	1
SIP	165	52	2.2	3.3	5	~-	4
OCT	1.24	7.3	19	39	5	~	5
NOV	224	69	15	22	5	1	3
DEC	232	70	15	16	5	i	
TOTAL	1059	370	81	132	22	3	13
4-6							
Viic	564	113	3.0	83	9	~	1
deb	176	95	7.6	147	15	6	7
OCT	582	116	4.6	110	12	1	13
JOA -	333	76	30	70	11	2	3
DEC	295	5.7	2.7	31	12	1	
TOTAL	2300	457	220	411	59	10	24
6-8							
Aug	405	56	9	4	1	1	
Sch	282	30	5	13	8		1
OCT	641	91	2.2	30	11		6
VOV	671	0.3	5	17	17	4	5
DFC	494	69	13	31	16	i	,
TOTAL	2493	343	52	130	53	6	14
3-12							
	761	96	2.2	3.0			
AUC			32	39	16	2	1
SEP	593	65	1.3	40	5	3	2
OCT	770	85	37	59	13		7
NOV	035	103	7.0	102	20	2	9
DEC TOTAL	927	103	56 213	120 360	38 97	14 21	1.6 3.5
10-12							
AUG	65	6					
SEP	196	10					
OCT	230	21	4	19	3	1	
MOV	219	20	9	25	2 2	2	1
DEC	215	20	6	13	2	1	1
TOTAL,	935	77	19	48	7	4	2
12-14							
AUG	5.2	1					
CLB	13	1		1			
ocr	13	i					
HOY	103	i		1			
DEC	104	3	1	1	3		
TOTAL	295	22	1	3	3		

C-5 FLYING HOURS & MAINTENANCE ACTIONS FOR ALL AIRCRAFT AUGUST 1976 - MOVEMBER 1976

FLIGHT LENGTH	FLYING HOURS	SORTIES	WUC 64 INTERPHONE	WUC 65 IFF	WILC 66 DAES COM	WUC 71 RADIO NAV	YUC 72 RADAR NAV
0-2							
AUG	55	45	1		2		2
SEP	46	37	6		2	6	41
OCT	84	69	8			9	37
NOV	38	35	2	2	4	7	24
DEC	53	44	6		2	9	
					9		19
TOTAL	276	230	23	2	9	31	123
2-4							
AUG	314	126		2		5	22
SEP	165	52	8			8	40
OCT	124	7.3	12	2	3	5	37
MOA	224	69	7		1	5	2 1
DEC	232	70	3	1	3	3	14
TOTAL	1059		30	5	10	26	15)
4-6							
AUG	564	113	10		1	6	47
SEP	476	95	9	3	9	23	123
OCT	582	116	21	3	7	22	113
NOV	383	76	5	1	3	8	63
DEC	295	57	5	2	3	10	69
TOTAL	2300	457	50	2	23	69	420
6.0							
6-8 AUG	105	56	,		1	,	1.1
	405 282	39	1			3	11
SFP			3		6	. 2	23
NOV	641 671	91	10	2		14	41
			4	1	5	3	37
DEC	494	69	6		6	7	35
TOTAL	2493	343	24	3	27	3.4	147
3-10							
AUG	761	86	8		Λ	13	4.3
SEP	5B3	65	9		1	10	49
OCT	770	85	24	1	3	21	71
NOV	982	108	16	11	15	20	152
DEC	927	103	16	3	12	29	120
TOTAL	4023		73	15	35	93	437
10.10							
10-12							
AUG	65						
SEP	106	10					
OCT	230					1	11
NOV	219	20	3	1	2	9	26
DEC	215		2		1	1	17
TOTAL	835	77	5	1	3	11	54
12-14							
AUG	52	4					
SEP	13		2			1	2
OCT	13						
HOV	103						
DEC	104	3	1	1			4
TOTAL	285		3	i		1	6
GRAND TOTAL	11271	1951	209	36	107	265	1337

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C-5 FLYING HOURS & MAINTHIANCE ACTIONS FOR ALL AIRCRAFT ANGUST 1976 - NOVEMBER 1976

Tr.ACa.A	PLYING HOURS	SORTIES	TUC 91 EHER FOPT	97 FIRE EXT	TOTAL	MAINT. ACTIONS PER FLY HR	MAINT. ACTIONS PER SORT
0-2							
AUG	35	45			175	3.18	3.89
SEP	46	37	2		617	13.41	16.69
OCT	9.4	69	5	8	805	9.58	11.67
MOA	33	35	4	i	481	12.66	13.74
200	53	44	2		613	11.56	13.93
TOTAL	276	230	13	9	2691	9.75	11.70
2-4							
AUG	314	106		2	320	1.02	3.02
SEP	165	52	2	14	897	5.44	17.25
OCT	124	73	4	2	569	4.59	7.79
VOV	224	69		12	472	2.11	6.84
		70					
TOMAL	1059		13	1 31	327 2585	1.40 2.44	4.67 6.98
4-6					726		
AUG	564	113	6		726	1.29	6.42
SEP	476	95	11	1	1729	3.63	18.20
OCT	582	116	3	2	1642	2.82	14.15
MOV	333		4	5	757	1.98	9.96
DEC	295		3	1	759	2.57	13.31
TOTAL	3300	457	32	9	5613	2.14	12.28
6-8							
AUG	4 2 5	56			256	.63	4.57
STP	282	30	6		379	1.34	9.72
OCT	641	91	4	2	678	1.06	7.45
NON	671	93	6	11	676	1.01	7.27
DLC	494	69	11		614	1.24	8.39
TOTAL	2493	349	27	13	2603	1.04	7.47
8-10							
AUG	761	36	1	7	660	. 37	7.67
SEP	523	65	.1		866	1.49	13.32
OCT	770	25	3		1157	1.50	13.61
vov	932	107	1.4	14	2351	2.39	21.77
DEC	927	103	10	1	1941	2.09	18.34
TOTAL.	4023		3.2	22	6975	1.73	15.60
12-12							
7110	55	6			6	.09	1.00
SFP	106				4	.03	.40
ocm	230	21			112	.50	5.33
MON	219			1	319	1.45	15.95
DEC	215		3		239	1.11	11.95
TOTAL	935		ž	1	680	.31	3.33
12-11							
AUG	5.2	A					
SEP	13				33	2.53	33.00
OCT	13				33	2.33	33.00
JOV	123				3	.07	1.00
	104				38		4.75
TOWAL	235				79	.36	3.59
GEVED GOLY	11271	1951	120	85	21226	1.83	19.87

C-5 FLYING HOURS & MAINTENANCE ACTIONS FOR ALL ALBERTON AUGUST 1976 - NOVEMBER 1976

FLIGHT LENGTH	FLYING HOURS	SORTIES	TOTAL FXCLUDING 01-09	MAIP'. ACTIONS PER PLY HR	MAINT. ACTIONS PER SORT
0-2					
AUG	55	45	135	2.45	3.00
SEP	46	37	403	9.76	10.30
OCT	84	69	628	7.48	2.10
NOV	38	35	380	10.00	10.36
DEC	53	44	401	7.56	9.11
TOTAL	276	230	1947	7.05	8.46
2-4					
AUG	314	106	257	.32	2.12
SEP	165	52	542	3.28	10.42
OCT	124	73	463	3.73	6.34
NOV	224	69	360	1.61	5.22
DEC	232	70	237	1.02	3.33
TOTAL	1059	370	1859	1.75	5.02
4-6					
AUG	564	113	617	1.09	5.16
SEP	476	95	1475	3.10	15.53
OCT	582	116	1368	2.35	11.79
NOV	383		652	1.70	8.53
TOTAL	295 2300		592 4704	2.00 2.04	10.33
	2300	437	477	2.74	10.23
6-8	405		170		2.12
AUG	405	56 39	178	.44	3.13
SEP	282		265	. 94	6.79
OCT	641	91	566	.38	6.22
NOV	671		545	. 31	5.96
TOTAL	494 2493		509 2063	1.03	7.37 5.92
	2493	343	2063	• 32	3. 3.
9-10					
AUG	761		498	.65	5.79
SEP	583		603	1.23	9.23
OCT	770		914	1.19	10.75
NOV	982		1649	1.63	15.27
TOTAL	927 4023		1458 5122	1.57	14.15 11.15
10-12					
AUG	65	6	6	.09	1.00
SEP	106			- 0 3	
OCT	230	-	99	.43	4.71
NOV	219		256	1.16	12.39
DEC	215		176	.91	8.30
TOTAL	835	The second second	537	.61	6.37
12-14					
AUG	52				
SEP	13	1	32	2.46	32.00
OCT	13	1			
NOV	103	8	7	.06	.37
DEC	104	8	36	. 34	4.50
TOTAL	285	22	75	.26	3.40
RAND TOTAL	. 11271	1951	16307	1.11	8.35

APPENDIX 2

EXPLANATION OF WORK UNIT CODES (WUC)

WUC	DESCRIPTION
01	Ground Handling, Servicing and Related Tasks
02	Aircraft Cleaning
03	Scheduled Inspections
04	Special Inspections
05	Preservation, Depreservation, and Storage
06	Arming and Disarming
07	Preparation and Maintenance of Records
09	Shop Support General Codes
11	Airframe
12	Cockpit and Fuselage Compartments
13	Landing Gear
14	Flight Controls
23	Turbofan Power Plant System
24	Auxiliary Power Plant System
41	Air Conditioning, Pressurization, and Surface Ice Control
42	Electrical Power Supply
44	Lighting System
45	Hydraulic and Pneumatic Power Supply
46	Fuel System
47	Oxygen System
40	Missellaneous Utilities

51 Instruments 52 Autopilot Malfunction Detection Analysis/Recording System 55 61 HF Communications 62 VHF Communications 63 UHF Communications 64 Interphone 65 IFF 66 Emergency Communications 71 Radio Navigation 72 Radar Navigation

91

97

Emergency Equipment

Explosive Devices and Components

APPENDIX 3
MISSION CODE ANALYSIS
NOVEMBER 1976

NOVEMBER 1976

	WRITE- UPS PER SORTIE	12.46	14.70	7.23	6.49	9.08	10.70	8.51	6.75	9.84	29.81	12.40
님	0	187 1	294 1	141	331	313	439 1	230	445	433	1308 2	1 707 1
TOTAL	WRITE- UPS S(ALL WU	-	6	7		m	4	61	4	4	13	7
	WRIT UPS SORTIES (ALL	15	20	13	51	n	41	27	99	44	64	100
	E- WRITE- UPS PER WUC) SORTIE	c	13.00	4.00	13.55	11.14	15.60	16.00	2.66	0	47.5	13 61
OTHERS	WRITE- UPS (ALL WUC		92	4	122	73	78	32	16	ı	9.6	
	SORTIES	7	2	7	6	7	ın	C1	9	~	7	000
CODE	re- WRITS- UPS PER WUC)SORTIE S	39.00	1.50	6.50	.30	0	6.33	99.9	2.68	3.11	23.94	
MISSION CODE	WRITE- UPS (ALL WUC	39	6	26	4	•	76	40	43	28	521	707
MI	WRIT UPS SORTIES (ALL	7	9	4	13	1	12	ø	16	6	18	,
CODE	WRITE- UPS PER SORTIE	11.38	24.44	8,53	7.06	80	11.87	8,31	8.79	11.91	29.36	
BLANK MISSION COD	WRITE- WRITE- WRITE- UPS DES DES DES WALL WOOD SOFTIE	143	220	111	205	240	285	158	387	405	1292	
BLANK	SORTIES	13	6	13	29	27	24	19	44	34	44	
	FLIGHT	0-1	1-2	2-3	3-4	4-5	5-6	2-9	7-8	6-8	9-10	

ASPIN-WELCH TEST (SEE REF 10)

November 1976

X₁ = Blank Mission Code

 $X_2 = Ml$ Mission Code

X3 = Total of All Mission Codes

 \overline{X}_1 = 13.48 Maintenance Write-ups per Sortie

 \overline{X}_2 = 9.13 Maintenance Write-ups per Sortie

 \overline{X}_3 = 12.40 Maintenance Write-ups per Sortie

$$s_1^2 = \frac{\sum_{N_1-\overline{N}_1}^2 (x_1-\overline{x}_1)^2}{N_1-1} = 57.48 \qquad \frac{s_1^2}{N_1} = \frac{57.48}{10} = 5.748$$

$$s_{2}^{2} = \frac{\sum (x_{2} - \overline{x}_{2})^{2}}{N_{2} - 1} = 178.08 \frac{s_{2}^{2}}{N_{2}} = \frac{178.08}{10} = 17.808$$

$$s_3^2 = \frac{\sum (x_3 - \overline{x}_3)^2}{N_3 - 1} = 47.96 \frac{s_3^2}{N_3} = \frac{47.96}{10} = 4.796$$

$$c_{12} = \frac{5.748}{5.748 + 17.808} = .2440$$

$$c_{13} = \frac{5.748}{5.748 + 4.796} = .5451$$

$$c_{23} = \frac{17.808}{17.803 + 4.796} = .7878$$

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ASPIN-WELCH TEST (Cont'd)

November 1976

$$\frac{1}{n_{12}} = \frac{c_{12}^2}{N_1 - 1} + \frac{(1 - c_2)^2}{N_2 - 1} = \frac{.0595 + .5715}{.0701} = .0701 ; n_{12} = 14$$

$$\frac{1}{n_{12}} = \frac{c_{13}^2}{n_{1}-1} + \frac{(1-c_{13})^2}{n_{3}-1} = \frac{.2971 + .2069}{9} = .0560 ; n_{13} = 18$$

$$\frac{1}{n_{23}} = \frac{c_{23}^2}{N_2 - 1} + \frac{(1 - c_{23})^2}{N_3 - 1} = \frac{.6206 + .0450}{9} = .0739 \quad ; \quad n_{23} = 14$$

$$t_{12} = \frac{13.48 - 9.13}{5.748 + 17.808} = .8963 ; P = .3$$

$$t_{13} = \frac{13.48-12.40}{5.748 + 4.796} = .3326$$
; P = .7

$$t_{23} = \frac{9.13 - 12.40}{17.808 + 4.796} = -.6878 ; P = .5$$

In all cases tested, we conclude that the samples came from the same universe; that is, "blank" mission code and "Ml" mission code have the same maintenance writeup rate per sortie as the universe of all mission codes.

APPENDIX 4
MISSION CODE ANALYSIS
DECEMBER 1976

	BLANK	BLANK MISSION CODE	CODE	IN	MI MISSION CODE	CODE		OTHERS			TOTAL	
FLIGHT	SORTIES	WRITE- WRITE- UPS UPS PER LENGTH SORTIES (ALL WUC) SORTIE	WRITE- UPS PER)SORTIE	SORTIES	WRITE- UPS (ALL WUC	DE- WRITH- UPS PER WUC) SORTIE	SORTIES	WRITE- UPS (ALL WUC	E- WRITE- UPS PER WJC)SORTIE	SORTIES	WRITE- UPS (ALL WJC	'E- WRITE- UPS PER WUC) SORTIE
0-1	ω	239	29.87	м	10	3.33	C1	19	9.50	13	268	20.61
1-2	19	204	10.73	11	55	5.00	н	36	36.00	31	345	11.12
2-3	9	28	99.6	Ŋ	16	3.20	C1	16	8.00	13	06	6.92
3-4	31	195	6.29	21	7	.04	Ŋ	41	8.20	57	237	4.15
4-5	13	298	22.92	71	31	00.6	4	40	10.00	19	356	18.73
9-9	23	292	12.69	13	65	5.00	7	48	24.00	38	405	10.65
6-7	15	222	14.80	4	71	.50	S	47	9.40	24	271	11.29
7-8	24	137	5.70	19	101	5.31	7	16	8,00	45	254	5.64
8-9	16	97	90.9	35	770	22.00	ı	•	1	51	867	17.00
9-10	30	902	23.53	21	368	17.52	1	1	1	52	1074	20.65
TOTAL	185	2448	13.23	134	1406	10,49	24	313	13.04	343	4167	12,14

ASPIN-WELCH TEST (SEE REF 10)

December 1976

 $X_1 = Blank Mission Code$

 $X_2 = Ml$ Mission Code

 X_3 = Total of All Mission Codes

 \overline{X}_1 = 13.23 Maintenance Write-ups per Sortie

 \overline{X}_2 = 10.49 Maintenance Write-ups per Sortie

 \overline{X}_3 = 12.14 Maintenance Write-ups per Sortie

$$s_1^2 = \frac{\sum_{N_1-N_1}^2 (x_1-N_1)^2}{N_1-1} = 72.85$$
 $\frac{s_1^2}{N_1} = \frac{72.85}{10} = 7.285$

$$s_2^2 = \frac{\sum (x_2 - \overline{x}_2)^2}{N_2 - 1} = 64.94$$
 $\frac{s_2^2}{N_2} = \frac{64.94}{10} = 6.494$

$$s_3^2 = \frac{\sum (x_3 - \overline{x}_3)^2}{N_3 - 1} = 38.63$$
 $\frac{s_3^2}{N_3} = \frac{38.63}{10} = 3.863$

$$C_{12} = \frac{7.285}{7.285 + 6.494} = 5.287$$

$$C_{13} = \frac{7.285}{7.285 + 3.863} = .6534$$

$$C_{23} = \frac{6.494}{6.494 + 3.863} = .6270$$

ASPIN-WELCH TEST (Cont'd)

December 1976

$$\frac{1}{n_{12}} = \frac{c_{12}^{2}}{n_{1}-1} + \frac{(1-c_{2})^{2}}{n_{2}-1} = \frac{.2795 + .2221}{9} = .0550 ; n_{12} = 18$$

$$\frac{1}{n_{13}} = \frac{c_{13}^2}{N_1 - 1} + \frac{(1 - c_3)^2}{N_3 - 1} = \frac{.4269 + .1201}{9} = .0607 ; n_{13} = 17$$

$$\frac{1}{n_{23}} = \frac{c_{23}^2}{N_2 - 1} + \frac{(1 - c_3)^2}{N_3 - 1} = \frac{.3931 + .1391}{9} = .0591 ; n_{23} = 17$$

$$t_{12} = \frac{13.23 - 10.49}{7.285 + 6.494} = .7385 ; P = .4$$

$$t_{13} = \frac{13.23 - 12.14}{7.285 + 3.863} = .3263$$
; $P = .7$

$$t_{23} = \frac{10.49 - 12.14}{6.494 + 3.863} = .5124$$
; P = .6

In all cases tested, we conclude that the samples came from the same universe; that is, "blank" mission code and "M1" mission code have the same maintenance writeup rate per sortie as the universe of all mission codes.

APPENDIX 5

REGRESSION ANALYSIS

REGRESSION ANALYSIS

Based on 1951 sorties, 11271 flying hours, August - December 1976.

Regression Equation is in the form:

 $Y = C + AX_1 + BX_2$

Y = Number of maintenance writings

C = A constant

A = Coefficient of variable X₁

X, = Number of flying hours

 $B = Coefficient of variable X_2$

X, = Number of sorties

 R^2 = Coefficient of determination

J = Standard error of the estimate

WUC = Work unit code

R²FH = Coefficient of determination when only flying hours are used as a predictor of maintenance writings

R²S = Coefficient of determination when only sorties are used as a predictor of maintenance writeups.

							1			1		
R ² s	0.575	0.611	0.534	0.600	0.555	0.543	0.585	0.526	0.495	0.600	0.599	0.548
R ² PH	895.0	0.571	0.572	0.503	0.462	0.559	0.453	0.518	0.509	0.546	0.574	0.497
В	506*9	056.5	0.873	0.691	999.0	0.420	0.620	0.275	0.248	0.272	0.244	0.243
A	0.858	0.598	0.151	0.043	0.040	0.061	0.026	0.034	0.036	0.024	0.027	0.021
ບ	-54.676	-58.430	- 8.142	- 5.060	- 5.744	- 4.983	- 6.634	- 2.293	- 4.200	- 3.491	- 3.032	- 1.359
6	353,487	262,687	55.607	27.897	29.415	24.536	24.007	15.715	16.227	11.955	11.414	11.963
R ²	0.643	0.667	0.624	0.629	0.581	0.621	0.601	0.588	0.566	0.647	0.661	0.590
MAINT WRITEUPS (ACTUAL)	21226	16307	3121	1659	1552	1337	1276	835	745	683	676	199
DESCRIPTION		Excluding WUC 01-09	Airframe	Turbofan Power Plant	Landing Gear	Radar Navigation	Malfunction Detection Analysis Recording System	Air Conditioning Pressurization & Surface Ice Cont.	Instruments	Cockpit & Fuselage Compartments	Lighting System	Hydraulic & Pneumatic Power Supply
GROUP	ALL	ACFT	WUC 11	WUC 23	WUC 13	WUC 72	WUC 5.5	WUC 41	WUC 51	WUC 12	WUC 44	WUC 45